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(54) POLYAMIDE COMPOSITION FOR MOLDING MATERIAL

(57)Abstract:

PURPOSE: To obtain a polyamide composition reduced in water absorbency and improved in heat resistance, mechanical strengths, toughness, impact resistance, chemical resistance, hot-water resistance, lightweightness and moldability by mixing a specified polyamide with a powdery or fibrous filler.

CONSTITUTION: This composition comprises 100 pts.wt. polyamide made from a dicarboxylic acid component comprising 60-100mol% terephthalic acid and a diamine component comprising 60-100mol% 1,9-nonanediamine and having an intrinsic viscosity (in concentrated sulfuric acid at 30°C) of 0.4-3.0dl/g and 0.5-200 pts.wt. powdery filler having a mean particle diameter of 1-200 μ m and selected from silica (alumina), alumina, talc, graphite, TiO₂, MoS₂ and polytetrafluoroethylene or a fibrous filler having an average length of 0.1-200mm and selected from polyamide, glass, carbon and boron fibers.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Industrial Application]This invention relates to the new polyamide composition for molding materials. It has the outstanding heat resistance in detail, and is related with the polyamide composition for molding materials which consists of polyamide which is excellent in any performance of dynamics intensity, toughness, shock resistance, low water absorption property, chemical resistance, hot water resistance, lightweight nature, and a moldability. The molding material of this invention can be conveniently used as molding materials, such as industrial materials, industrial material, and household articles, for example.

[0002]

[Description of the Prior Art]Although the crystalline polyamide represented by nylon 6, Nylon 66, etc. from the former is widely used from the ease of the outstanding characteristic and melt molding as the object for garments, the textiles for industrial materials, or general-purpose engineering plastics, On the other hand, every problem with poor dimensional stability by the shortage of heat-resistant and water absorption is pointed out. The electrical and electric equipment and the electronic field which needs the reflow solder heat resistance especially accompanying development of a surface mount technology (SMT) in recent years, Or in the engine room parts etc. of the car where the demand to heat resistance is increasing every year, use by the conventional polyamide has become difficult and the demand to the polyamide which was more excellent in heat resistance, dimensional stability, a mechanical characteristic, and the physical chemistry characteristic is increasing.

[0003]The semi aromatic polyamide which uses terephthalic acid and a 1,6-hexanediamine as the main ingredients is variously proposed to the demand of such a world, and the part is put in practical use. However, since the polyamide (it is hereafter called PA6-T for short) which consists of terephthalic acid and a 1,6-hexanediamine has the melting point near 370 **

exceeding the decomposition temperature of polymer, melt polymerization and melt molding are difficult for it, and it does not bear practical use. therefore -- the actual condition -- aliphatic polyamide, such as dicarboxylic acid components, such as adipic acid and isophthalic acid, or nylon 6, -- 30-40-mol % -- the actual condition is used for the actual use possible about temperature range, i.e., 280-320 **, by the low-melting-point-ized presentation by carrying out copolymerization. Thus, the thing to do for copolymerization of a lot of third components (it is the 4th ingredient depending on the case), Various physical properties, such as rigidity under an elevated temperature, chemical resistance, and dimensional stability, not only fall, but surely apart from an effective thing, it invites the fall of the productivity accompanying extension of a molding cycle to low melting point-ization of polymer with the fall of a crystallization rate and an attainment degree of crystallinity as a result. If compared with the conventional aliphatic polyamide by introducing an aromatic group also about change of various physical properties, such as dimensional stability by water absorption, although it will be improved somewhat, even the level of substantial problem solving is not reached. It is indicated to JP,64-11073,B, JP,59-155426,A, etc. that such a problem can improve by blending bulking agents, such as glass powder, graphite powder, glass fiber, and carbon fiber, to resin. Although surely the above-mentioned problem improves to some extent according to such correspondence, each above-mentioned problem is based on the essence of resin, and it cannot still be said that it is a satisfying thing.

[0004]To JP,64-11073,B, JP,62-36459,A, JP,1-19809,B, and JP,3-281532,A. As a diamine component of semi aromatic polyamide, it is mentioned besides the 1,6-hexanediamine that it is usable in more nearly long-chain straight chain aliphatic diamine. However, there is also no suggestion that the especially outstanding performance is revealed as compared with the case where a 1,6-hexanediamine is used in these prior art references by using with a carbon numbers of seven or more diamine.

[0005]

[Problem(s) to be Solved by the Invention]

[0006]The purpose of this invention is excellent in heat resistance, and there is in providing the polyamide composition for molding materials excellent in any performance of dynamics intensity, toughness, low water absorption property, chemical resistance, hot water resistance, lightweight nature, and a moldability.

[0007]

[Means for Solving the Problem]As opposed to polyamide which uses terephthalic acid and 1,9-nonanediamine as the main ingredients as a result of inquiring wholeheartedly, in order that this invention persons may solve the above-mentioned technical problem, It found out that a resin composition for molding materials excellent in any performance of heat resistance, dynamics intensity, toughness, low water absorption property, chemical resistance, hot water

resistance, lightweight nature, and a moldability could be obtained for the first time in a constituent which blended a powder filler of a specific amount, or a fibrous filler of a specific amount, and this invention was completed.

[0008]A dicarboxylic acid component 60 - whose 100-mol% of the [A] dicarboxylic acid components of the above-mentioned purpose are terephthalic acid according to this invention, 60-100-mol% of diamine components consist of a diamine component which is 1,9-nonanediamine, Limiting viscosity $[\eta]$ measured at 30 °C among concentrated sulfuric acid is in a range whose polyamide 100 weight section; and [B] mean particle diameter which are 0.4 - 3.0 dl/g are 0.1mmicro-200micro, And it is attained by providing a polyamide composition for molding materials which consists of 0.5 to fibrous filler 200 weight section which 0.5 to powder filler 200 weight section chosen from the following group or average length is in the range of 0.1-200 mm, and is chosen from the following group. Powder filler: Silica, a silica alumina, alumina, talc, graphite, a titanium dioxide, molybdenum disulfide, polytetrafluoroethylene fiber-like bulking agent:all aromatic polyamide textiles, glass fiber, carbon fiber, a boron fiber [0009] Hereafter, this invention is explained concretely. a terephthalic acid component is more than 60 mol % among dicarboxylic acid components of polyamide [A] used for this invention -- desirable -- more than 75 mol % -- it is more than 90 mol % more preferably. When a terephthalic acid component is less than [60 mol %], since various physical properties, such as the heat resistance of polyamide obtained, chemical resistance, and hot water resistance, fall, it is not desirable.

[0010]As other dicarboxylic acid components other than a terephthalic acid component, Malonic acid, dimethylmalonic acid, succinic acid, glutaric acid, adipic acid, 2-methyladipic acid, trimethyl adipic acid, pimelic acid, 2,2-dimethylglutaric acid, Aliphatic-dicarboxylic-acid;1,3-cyclopentane dicarboxylic acid, such as 3,3-diethylsuccinic acid, azelaic acid, sebacic acid, and suberic acid, Alicyclic dicarboxylic acid, such as 1,4-cyclohexanedicarboxylic acid; Isophthalic acid, 2, 6-naphthalene dicarboxylic acid, 2, 7-naphthalene dicarboxylic acid, 1,4-naphthalene dicarboxylic acid, 1,4-phenylene dioxy diacetate, 1,3-phenylenedioxy diacetate, diphenic acid, JI benzoic acid, 4,4'-oxydi benzoic acid, Aromatic dicarboxylic acid, such as diphenylmethane 4,4'-dicarboxylic acid, diphenylsulfone 4,4'-dicarboxylic acid, and 4,4'-biphenyl dicarboxylic acid, or these arbitrary mixtures can be mentioned. Aromatic dicarboxylic acid is used preferably among these. Polyvalent carboxylic acid, such as trimellitic acid, trimesic acid, and pyromellitic acid, can also be used within limits with melt molding possible in which.

[0011]as a diamine component of polyamide used for this invention, a 1,9-nonane diamine component is more than 60 mol % -- desirable -- more than 75 mol % -- it is more than 90 mol % more preferably. If a presentation of a diamine component is this range, since it excels in shock-proof each [the heat resistance of polyamide obtained, a moldability, low water

absorption property lightweight nature, and] performance, it is desirable.

[0012]As other diamine components other than a 1,9-nonane diamine component, Ethylenediamine, propylenediamine, 1,4-butanediamine, A 1,6-hexanediamine, 1,8-octanediamine, 1,10-Deccan diamine, 1,12-dodecanediamine, 3-methyl-1,5-pentanediamine, A 2,2,4-trimethyl 1,6-hexanediamine, a 2,4,4-trimethyl 1,6-hexanediamine, Aliphatic diamine, such as 2-methyl-1,8-octanediamine and 5-methyl-1,9-nonanediamine; A cyclohexanediamine, Alicyclic diamine, such as methylcyclohexanediamine and isophoronediamine; P-phenylene diamine, Aromatic diamine, such as m-phenylenediamine, xylenediamine, 4,4'-diaminodiphenylmethane, 4,4'-diaminodiphenyl sulfone, and 4,4'-diaminodiphenyl ether, or these arbitrary mixtures can be mentioned. 2-methyl-1,8-octanediamine is especially preferred.

[0013]Polyamide which is a constituent of a constituent of this invention, An end group of the chain more preferably not less than 10% Not less than 40%, It is desirable to be closed not less than 70% of still more preferably with end encapsulant which is a compound of monofunctional nature which has an amino group of polyamide ends, such as monocarboxylic acid and monoamine, or a carboxyl group, and reactivity. By performing end closure, a constituent in which the performances, such as fusion stability and hot water resistance, were further excellent can be obtained.

[0014]Although the amount of end encapsulant used which can be used when manufacturing polyamide which is a constituent of a constituent of this invention changes with the reactivity of end encapsulant to be used, the boiling point, a reaction apparatus, reaction conditions, etc., Usually, it is used by 0.1-15-mol% of within the limits to the total number of mols of dicarboxylic acid and diamine.

[0015]Polyamide which is a constituent of a constituent of this invention can be manufactured using arbitrary methods known as a method of manufacturing crystalline polyamide. For example, it can polymerize by methods, such as a solution polymerization method which uses acid chloride and diamine as a raw material or interfacial polymerization, a melt polymerization method which uses dicarboxylic acid and diamine as a raw material, a solid-state-polymerization method, and the melting extrusion machine polymerizing method. Below, an example of a method of polymerizing polyamide is shown.

[0016]According to this invention persons' research, a catalyst and if needed end encapsulant, After adding collectively to diamine and dicarboxylic acid first and manufacturing nylon salt, Polyamide of this invention can be easily obtained by limiting viscosity [η] at 30 °C once considering it as a prepolymer of 0.10 - 0.60 dl/g among concentrated sulfuric acid at temperature of 200-250 °C, and carrying out solid state polymerization further, or polymerizing using a melting extrusion machine. Polyamide excellent in various performances and a moldability of a prepolymer which have few gaps of mol balance of a carboxyl group and an

amino group and falls of a rate of polymerization in a stage of postpolymerisation as limiting viscosity $[\eta]$ is within the limits of 0.10 - 0.60 dl/g and in which molecular weight distribution is still smaller is obtained. When solid state polymerization performs a culmination of a polymerization, if it is within the limits whose polymerization temperature is 200-280 **, a rate of polymerization is large, and since it excels in productivity and coloring and gelling can be pressed down effectively, it is desirable [it is preferred to carry out under decompression or inactive gas circulation, and]. When a melting extrusion machine performs a culmination of a polymerization, since polyamide which does not almost have decomposition of polyamide as polymerization temperature is 370 ** or less, and does not have degradation is obtained, it is desirable.

[0017]Limiting viscosity $[\eta]$ measured at 30 ** among concentrated sulfuric acid of polyamide used for this invention is 0.4 - 3.0 dl/g, and is 0.8 - 1.8 dl/g more preferably 0.6 to 2.0 dl/g.

[0018]Face manufacturing the above-mentioned polyamide and besides the aforementioned end encapsulant, for example as a catalyst, On phosphoric acid, phosphorous acid, hypophosphorous acid, its salt or its ester, and a concrete target, potassium, Sodium, magnesium, vanadium, calcium, zinc, cobalt, Metal salt and ammonium salt, such as manganese, tin, tungsten, germanium, titanium, and antimony, Ethyl ester, isopropyl ester, butylester, hexyl ester, isodecyl ester, octadecyl ester, decyl ester, stearylester, phenyl ester, etc. can be added.

[0019]A polyamide composition for molding materials of this invention contains a powder filler of 0.5 - 200 weight section, or a fibrous filler of 0.5 - 200 weight section to polyamide 100 weight section as a bulking agent [B]. As a powder filler, silica, a silica alumina, alumina, talc, graphite, a titanium dioxide, molybdenum disulfide, and polytetrafluoroethylene are used. Graphite, molybdenum disulfide, and polytetrafluoroethylene are used among these especially preferably. If graphite, molybdenum disulfide, and polytetrafluoroethylene are used, since abrasion resistance, such as a dynamic friction coefficient of a Plastic solid acquired from this constituent, the Taber wear, and a limiting PV value, will improve, it is desirable. Since its above-mentioned abrasion resistance will improve remarkably if mean particle diameter of this bulking agent is usually in the range of 0.1micro-200micro, especially the range of 1micro-100micro, it is preferred. A blending ratio of this bulking agent needs to be in the range of 0.5 to 200 weight section to this polyamide 100 weight section, and is the range of 0.5 to 50 weight section preferably [it is desirable and] to the range of 0.5 to 100 weight section, and profit.

[0020]As a fibrous filler, textiles of an organic system or glass fiber of an inorganic system, carbon fiber, or boron textiles are used. As a fibrous filler of an organic system, among these fibrous fillers, Poly para-phenylene terephthalamide textiles, PORIA meta-phenyleneterephthalamide textiles, Poly para-phenylene isophthalamide textiles, PORIA meta-phenyleneisophthalamide textiles, All the aromatic polyamide textiles, such as textiles obtained

from a condensate from diaminodiphenyl ether, terephthalic acid, or isophthalic acid, or all the aromatic-liquid-crystal-polyester textiles are used. If such organic system textiles are used, since the mechanical characteristic of a Plastic solid acquired from this constituent and heat resistance characteristics will come to improve, it is desirable. If the above-mentioned textiles of an inorganic system are used, since the mechanical characteristic of a Plastic solid acquired from this constituent, heat resistance characteristics, a chemical physical characteristic, etc. will improve, it is desirable. The average length of a fibrous filler of said organic system or an inorganic system can use 5-50 mm long textiles or 0.05-5-mm short textiles. If the aforementioned average length is in the range of 1-10 mm especially, since the heat resistance of a Plastic solid which can hold the good moldability of this constituent and is acquired from this constituent, and a mechanical property will come to improve, it is desirable. A blending ratio of a fibrous filler of said organic system or an inorganic system needs to be in the range of 0.5 to 200 weight section to this polyamide 100 weight section, and is the range of five to 150 weight section preferably [it is desirable and] to the range of one to 180 weight section, and profit. Fabricating of these fibrous fillers may be carried out to cross state etc.

[0021]If a blending ratio of said powdered or fibrous bulking agent increases more than 200 weight sections to this polyamide 100 weight section, the flexibility of a Plastic solid acquired from the moldability of this constituent and this constituent will come to fall remarkably.

[0022]The above powdered or fibrous bulking agents are independent, or can be combined and used. These bulking agents may be processed by the Silang coupler, a titanium coupler, etc. Other bulking agents which have various gestalten, such as tabular and cross state, may be contained in a constituent of this invention in the range which does not spoil the purpose of this invention other than the above-mentioned powdered or fibrous bulking agent.

[0023]A polyamide composition for molding materials of this invention makes an indispensable constituent said polyamide [A] and said bulking agent [B], may be a constituent which comprises only these both constituents, and may contain other ingredients. As ingredients other than the aforementioned constituent added by polyamide composition for molding materials of this invention if needed, A publicly known hindered phenolic antioxidant, a hindered amine system antioxidant, the Lynn system antioxidant, a thio system antioxidant, colorant, an ultraviolet ray absorbent, a SadamuMitsuyasu-ized agent, a spray for preventing static electricity, a plasticizer, lubricant, a nucleus agent, fire retardant, or other type polymer is mentioned from the former.

[0024]A method of blending a bulking agent, etc. can be illustrated as a method of preparing a polyamide composition for molding materials of this invention, maintaining polyamide of said constituent to a molten state.

[0025]A polyamide composition for molding materials of this invention can be fabricated by the usual melt molding, for example, compression molding, injection molding, or extrusion molding.

[0026]As mentioned above, a polyamide composition for molding materials of this invention, It has the outstanding heat resistance, and it excels in any performance of dynamics intensity, toughness, shock resistance, low water absorption property, chemical resistance, hot water resistance, lightweight nature, and a moldability, and can be used conveniently for industrial materials, industrial material, household articles, etc. as engineering plastics.

[0027]

[Example]Hereafter, although an example explains concretely the polyamide composition for molding materials of this invention, this invention is not restricted at all by these. The end closure rate in an example, limiting viscosity, melt viscosity stability, the temperature width that can be fabricated, specific gravity, tensile strength, tension elongation, shock-resistant intensity, the rate of elevated-temperature bending flexibility, balanced water absorption, hot water resistance, and alcohol resistance were measured by the following methods.

[0028]End closure rate: Using $^1\text{H-NMR}$ (it measures at 50 ** among 500 MHz and deuterated trifluoroacetic acid), from the integral value of the characteristic signal for every end group, the number of a carboxyl group end, an amino group end, and closure ends was measured, respectively, and it asked for the end closure rate from the following formula (1). The chemical shift value of the typical signal used for measurement is shown below.

Closure rate (%) = $[(A-B) / A] \times 100 \dots\dots (1)$

[A expresses a molecular-chain-terminals group total (this is usually equal the twice of the number of polyamide molecules) among a formula, and B expresses the total number of a carboxyl group end and an amino group end.]

[0029]

[Table 1]

末端基の種類	特性シグナルの化学シフト値
$\begin{array}{c} \text{O} \\ \parallel \\ -\text{N}-\text{C}-\text{C}_6\text{H}_4-\text{CO}_2\text{H} \\ \\ \text{H} \end{array}$	δ 8. 3 p p m
$\begin{array}{c} \text{O} \\ \parallel \\ -\text{N}-\text{C}-\text{C}_6\text{H}_4-\text{CO}_2\text{H} \\ \\ \text{H} \end{array}$	δ 8. 6 p p m
$\begin{array}{c} \text{O} \\ \parallel \\ -\text{C}-\text{N}-(\text{CH}_2)_9-\text{NH}_2 \\ \\ \text{H} \end{array}$	δ 3. 3 p p m
$\begin{array}{c} \text{O} \\ \parallel \\ -\text{C}-\text{N}-(\text{CH}_2)_6-\text{CH}(\text{CH}_3)-\text{CH}_2-\text{NH}_2 \\ \\ \text{H} \end{array}$	δ 3. 1 p p m
$\begin{array}{c} \text{O} \\ \parallel \\ -\text{N}-\text{C}-\text{C}_6\text{H}_5 \\ \\ \text{H} \end{array}$	δ 7. 6 p p m

[0030]Limiting viscosity [eta]: The intrinsic viscosity (eta_{inh}) of the sample with a concentration of 0.05, 0.1, 0.2, and 0.4 g/dl was measured at 30 ** among concentrated sulfuric acid, and the value which extrapolated this to the concentration 0 was made into limiting viscosity [eta].

eta_{inh} = [ln (t₁/t₀)] / c [eta_{inh} expresses intrinsic viscosity (dl/g) among a formula, t₀ expresses the down flowing time (second) of a solvent, t₁ expresses the down flowing time (second) of the sample solution, and c expresses the concentration (g/dl) of the sample in a solution.]

[0031]Melt-viscosity stability: It is a KYAPI log rough about the melt viscosity (1000 s of shear rate⁻¹) of a constituent [in / vacuum drying of the constituent of a pellet type is carried out at 120 ** under decompression, and / 330 ** and 350 **]. It measured using [the product made from Oriental Energy Machine, and ratio-of-length-to-diameter=10]. The value which broke the value of the melt viscosity (poise) in 350 ** by the value of the melt viscosity (poise) in 330 ** was made into the index of melt viscosity stability.

[0032]Temperature width which can be fabricated: Melting holding time was carried out for 5 minutes, the die temperature was 150 **, temperature conditions were changed, injection molding was performed, and the lower limit temperature which can be fabricated, and the upper limit temperature which the air bubbles by decomposition begin to generate and which can be fabricated were measured.

[0033]Specific gravity: It measured using the density gradient tube.

[0034]Tensile strength, **** elongation, shock-resistant intensity: The test piece of the absolute dry condition which carried out injection molding at a temperature higher about 20 ** than the melting point of polyamide was measured by the following methods.

[0035]

[Table 2]

試験項目	試験方法	試験片寸法
引張強度	J I S K - 7 1 1 3	J I S 1 号ダンベル型 (3 mm 厚み)
引張伸び	同上	同上
耐衝撃強度	A S T M D 2 5 6	6 3 . 5 × 1 3 × 3 mm

[0036]Elevated-temperature elastic modulus: According to ASTM D790, using a 127x14x6.4-mm injection-molding specimen, the rate of bending flexibility was measured at 200 **, and the value was made into the rate of elevated-temperature bending flexibility.

[0037]Balanced water absorption : Carried out heat pressing at a temperature higher 20 ** than the melting point, and performed cooling for 5 minutes at 150 **. After drying for five days and carrying out weighing of the film (5 cm x 5 cm) about 200 micrometers thick at 120 ** under decompression, it was immersed in underwater [23 **] for ten days, weighing was carried out to it, and it asked as a rate (%) over the weight before increased immersion.

[0038]Hot water resistance: Steaming treatment of the piece of JIS No. 1 dumbbell type injection molding was carried out in resisting pressure autoclave on condition of 120 ** [2 atmospheres] //120 h, and vacuum drying of the sample was carried out at 120 ** for 120 hours. It asked for the retention (%) to the value before processing of the tensile strength of the sample after processing.

[0039]Reference example 1 terephthalic acid 3239.6 g (19.5 mol), 3165.8 g (20.0 mol) 1,9-nonanediamine, The benzoic acid 122.1g (1.0 mol), 6.5g (it is 0.1 % of the weight to a raw material) of sodium hypophosphite monohydrate, and 6 l. of distilled water were put into autoclave with a content volume of 20 l., and the nitrogen purge was carried out. It agitated for 30 minutes at 100 **, and temperature up of the internal temperature was carried out to 210 ** over 2 hours. At this time, pressure up of the autoclave was carried out to 22 kg/cm². It was made to react, extracting a steam gradually and maintaining [after continuing a reaction then for 1 hour, carry out temperature up to 230 **, keep temperature at 230 ** after that for 2 hours,] a pressure at 22 kg/cm². Next, lowered the pressure to 10 kg/cm² over 30 minutes, and also it was made to react for 1 hour, and limiting viscosity [eta] obtained the prepolymer of 0.25 dl/g. Under 100 ** and decompression, it dried for 12 hours and this was ground to the size of 2 mm or less. Solid state polymerization of this was carried out under 230 ** and 0.1mmHg for 10 hours, and, in 317 ** and limiting viscosity [eta], the melting point obtained the white polyamide 1.01 dl/g and whose closure rate of an end are 90%.

[0040]The reference example 2 above-mentioned polyamide was dried at 120 ** under decompression for 24 hours, and the dry blend was carried out to 6 mm of average length's

glass fiber (PPG3540 made from PPG). Using 1 axis extrusion machine (the screw diameter of 40 mm, ratio-of-length-to-diameter=28, cylinder-temperature =320-350 **, number of rotations = 60 rpm), melt kneading of this was carried out and it was pelletized.

[0041]The various-physical-properties value of the mold goods obtained by carrying out injection molding of the constituent which blended the polyamide (100 weight sections) obtained by the example 1 reference example 1 and glass fiber (30 weight sections) by the method indicated to the reference example 2 with the cylinder temperature of 340 ** and the die temperature of 100 ** was measured. The obtained result is shown in the following table 3.

[0042]In the example 2 reference example 1, terephthalic acid was set to 3405.8 g (20.5 mol), and polyamide was polymerized by the method indicated to the reference example 1 except not having used benzoic acid. Next, the various-physical-properties value of the mold goods obtained by carrying out injection molding of the constituent which blended the obtained polyamide (100 weight sections) and glass fiber (30 weight sections) by the method indicated to the reference example 2 with the cylinder temperature of 340 ** and the die temperature of 100 ** was measured. The obtained result is shown in the following table 3.

[0043]In the example 3 reference example 1, terephthalic acid 3256.2 g (19.6 mol), 97.7g (0.8 mol) use of the benzoic acid was carried out, and polyamide was polymerized by the method indicated to the reference example 1 except having carried out 316.58g (2.0 mol) use of 2849.2 g (18.0 mol) and the 2-methyl-1,8-octanediamine for 1,9-nonanediamine as a diamine component. Next, the various-physical-properties value of the mold goods obtained by carrying out injection molding of the constituent which blended the obtained polyamide (100 weight sections) and glass fiber (30 weight sections) by the method indicated to the reference example 2 with the cylinder temperature of 340 ** and the die temperature of 100 ** was measured. The obtained result is shown in the following table 3.

[0044]In the example 4 reference example 1, terephthalic acid 3389.2 g (20.4 mol), Polyamide was polymerized by the method which indicated benzoic acid to the reference example 1 use and except not having carried out Zia use but having carried out 316.58g (2.0 mol) use of 2849.2 g (18.0 mol) and the 2-methyl-1,8-octanediamine for 1,9-nonanediamine as a diamine component. Next, the various-physical-properties value of the mold goods obtained by carrying out injection molding of the constituent which blended the obtained polyamide (100 weight sections) and glass fiber (30 weight sections) by the method indicated to the reference example 2 with the cylinder temperature of 340 ** and the die temperature of 100 ** was measured. The obtained result is shown in the following table 3.

[0045]The various-physical-properties value of the mold goods obtained by carrying out injection molding of the constituent which blended the polyamide (100 weight sections), the glass fiber (30 weight sections), and the ***** bead (three weight sections) which were obtained in example 5 Example 4 by the method indicated to the reference example 2 with the

cylinder temperature of 340 ** and the die temperature of 100 ** was measured. The obtained result is shown in the following table 3.

[0046] In the comparative example 1 reference example 1, 2325.9 g (14.0 mol) terephthalic acid, Polyamide was polymerized by the method indicated to the reference example 1 except having considered it as the isophthalic acid 996.8g (6.0 mol), a 2324.2 g (20.0 mol) 1,6-hexanediamine, and 24.43 g (0.20 mol) benzoic acid. Next, the various-physical-properties value of the mold goods obtained by carrying out injection molding of the constituent which blended the obtained polyamide (100 weight sections) and glass fiber (30 weight sections) by the method indicated to the reference example 2 with the cylinder temperature of 340 ** and the die temperature of 100 ** was measured. The obtained result is shown in the following table 3.

[0047]

[Table 3]

	実施例 1	実施例 2	実施例 3	実施例 4	実施例 5	比較例 1
ポリアミド組成	9-T	9-T	9M-T	9M-T	6-IT	6-IT
ポリアミド [A] [η] (dl/g) 末端封止率 (%)	1.01 90	1.05 0	1.10 85	1.12 0	1.10 85	1.02 45
充填剤 [B] 種類 (配合量 wt %)	ガラス繊維 (30%)	ガラス繊維 (30%)	ガラス繊維 (30%)	ガラス繊維 (30%)	ガラス繊維 (30%) ガラスビーズ (3%)	ガラス繊維 (30%)
成形性 溶融粘度安定性 成形可能温度幅	1.9 25	2.0 25	1.8 30	2.1 30	1.9 30	6.5 15
組成物物性 比重	1.37	1.38	1.35	1.35	1.40	1.43
引張強度 (kg/cm ²)	2300	2150	2260	2220	2130	2030
引張伸び (%)	4	3	5	5	4	3
耐衝撃強度 (kgcm/cm)	11	10	12	11	10	5
高温曲げ弾性率 (10 ⁴ kg/cm ²)	2.5	2.5	2.4	2.5	2.6	1.4
平衡吸水率 (%) (23℃水中浸漬)	1.8	1.9	1.8	1.9	1.5	4.5
耐熱水性 (%)	100	97	100	96	100	85
耐アルコール性 (%)	95	89	93	86	95	40

[0048]

[Effect of the Invention] The polyamide composition for molding materials of this invention is excellent in heat resistance, and it is excellent in any performances, such as dynamics intensity, toughness, low water absorption property, chemical resistance, hot water resistance, lightweight nature, and a moldability.

It can be conveniently used as molding materials, such as industrial materials, industrial material, and household articles.

[Translation done.]